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# Chapter 1 — ISDN Interfaces: DTI and PRI

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## Overview of ISDN

Integrated Services Digital Network (ISDN) is a global networking strategy that provides a single, intelligent, universal network for voice and data communications. ISDN is a set of international standards that define the next generation of digital networking services.

Some of the benefits of ISDN are as follows:

- faster, more accurate, noise-free transmission, as well as greater security and reliability
- ability to carry multiple information types, including speech, data, image, and video
- standard interfaces to allow multi-vendor compatibility
- configuration flexibility when combining public and private networking facilities.

ISDN differs from traditional communication in that it uses “out-of-band” signaling. Signals are sent and received on a dedicated D-channel, leaving the remaining channels, called B-channels, free for voice and data.

## Digital Trunk Interface

Digital Trunk Interface (DTI) pre-dates ISDN and Primary Interface (PRI). It is used for connections between PBX systems, or between a PBX and a Central Office. DTI may or may not be associated with ISDN features and functionalities.

This networking arrangement, like PRI, makes use of a digital carrier with 24 channels (T-1) instead of using dedicated trunks. Unlike PRI, DTI uses “in-band” signaling instead of using a D-channel.

In DTI, “A” and “B” bits are used to imitate traditional trunk signaling (ground start, loop start, and so on). These signaling bits rob bits from B-channels, reducing the number of bits available for voice and data from 64 K to 56 K.

Table 1 shows the impact that out-of-band (PRI) signaling versus in-band (DTI) signaling has on data transmission.

**Table 1**  
**DTI and PRI data transmission**

| Data Transmission Types | DTI             | PRI             |
|-------------------------|-----------------|-----------------|
| Asynchronous            | up to 19.2 kbps | up to 19.2 kbps |
| Synchronous             | up to 56 kbps   | up to 64 kbps   |

## ISDN interfaces

Meridian 1 Networking currently supports three forms of ISDN network interfaces:

- 23B+D Primary Rate Interface (23B+D PRI)
- nB+D Primary Rate Interface (nB+D PRI)
- nB+D ISDN Signaling Link Interface (nB+D ISL)
- 2B+D Basic Rate Interface (2B+D BRI)

**Note:** As noted earlier, this document does not contain information on ISDN BRI - this information is contained in the *ISDN BRI Administration and Maintenance* 553-3011-311.

## **Primary Rate Interface**

Primary Rate Interface is characterized by digital carriers and out-of-band signaling. All signaling is done over a D-channel, leaving the remaining B-channels free for voice and data transmission. The D-channel carries all the call set-up, call tear-down, calling line identification, and feature activation information.

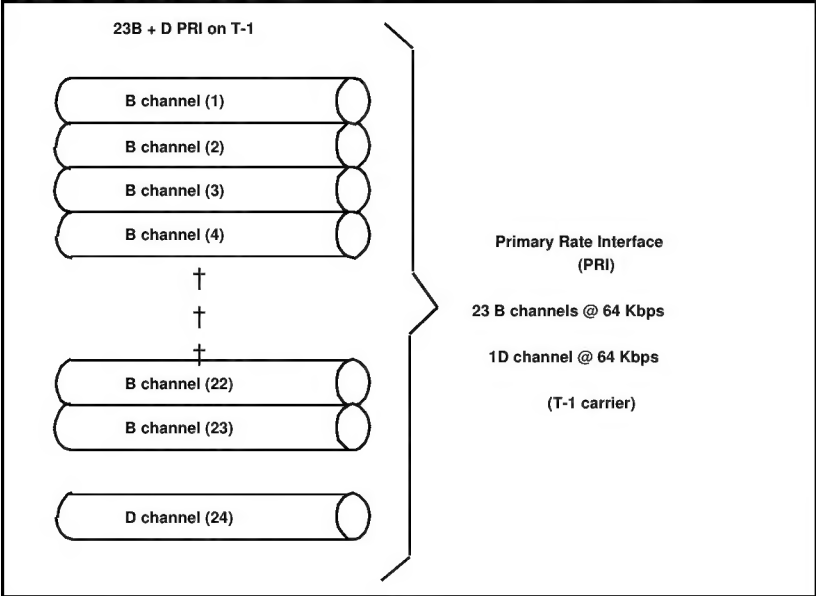
PRI is referred to as either “23B+D” or “nB+D”. This distinction is based on the fact that one D-channel can support multiple digital carriers. In other words, the choice exists to have one D-channel per digital carrier, or to have one D-channel support a number of carriers.

### **23B+D Primary Rate Interface**

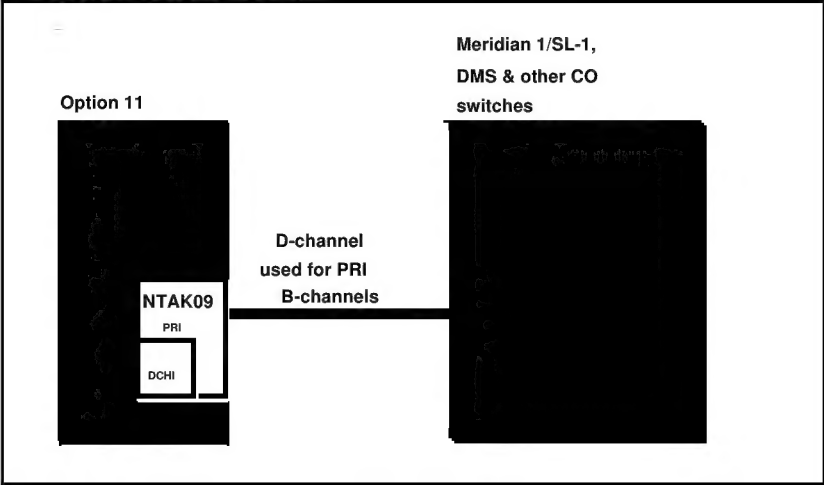
In the 23B+D PRI arrangement, each digital carrier has its own D-channel. The first 23 channels are used for voice and data, while the 24th channel is always used as the D-channel. Voice and data channels are “clear”, meaning all 64 K are used for voice and data transmission.

Figures 1 and 2 describe 23B+D Primary Rate Interface.

**Figure 1**  
**The 23B+D PRI Structure**



**Figure 2**  
**23B+D PRI to the Network**



**Note:** DCHI stands for D-Channel Handler Interface.

### **nB+D Primary Rate Interface**

In an nB+D PRI arrangement, one D-channel supports multiple digital carriers. A back-up D-channel is usually recommended when one D-channel is supporting a large number of channels.

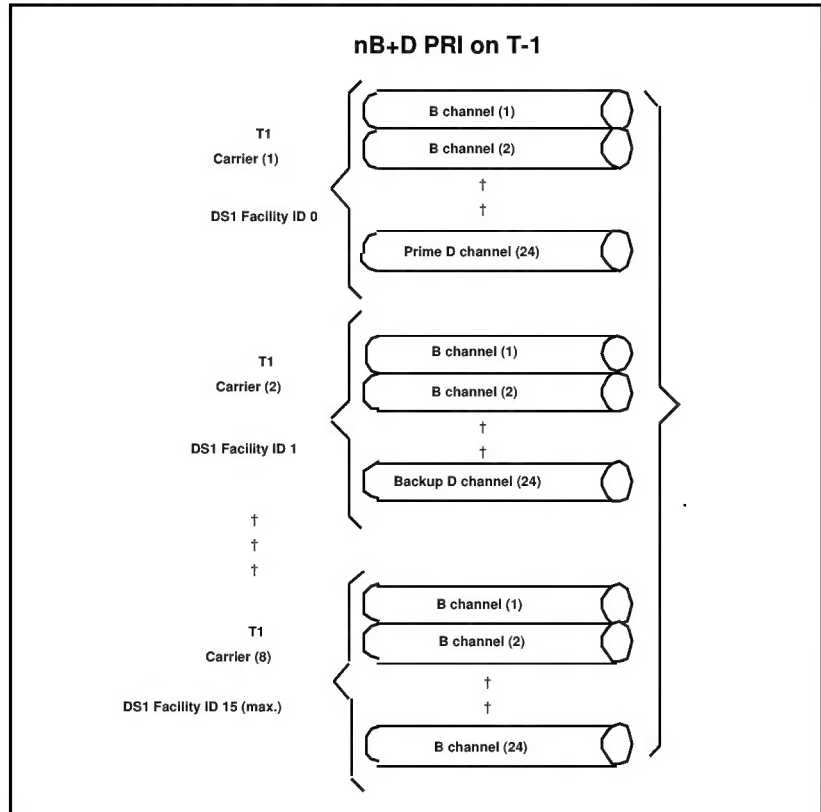
**Note:** CCITT currently specifies the PRI layer 1 protocol as a 23 + B structure. Layer 3 (Q.931), however, supports a larger PRI made up of multiple DS1 facilities.

On the Option 11 system, n (from nB+D) can be as large as 190 when a backup D-channel is present. This number is calculated as follows:

- One D-channel can support up to 8 carriers.  
Number of channels:  $24 \times 8 = 192$  B-channels.
- Two of these channels are used as D-channels; one as a primary D-channel and one as a backup D-channel.  
Total B-channels:  $192 - 2 = 190$  B-channels.

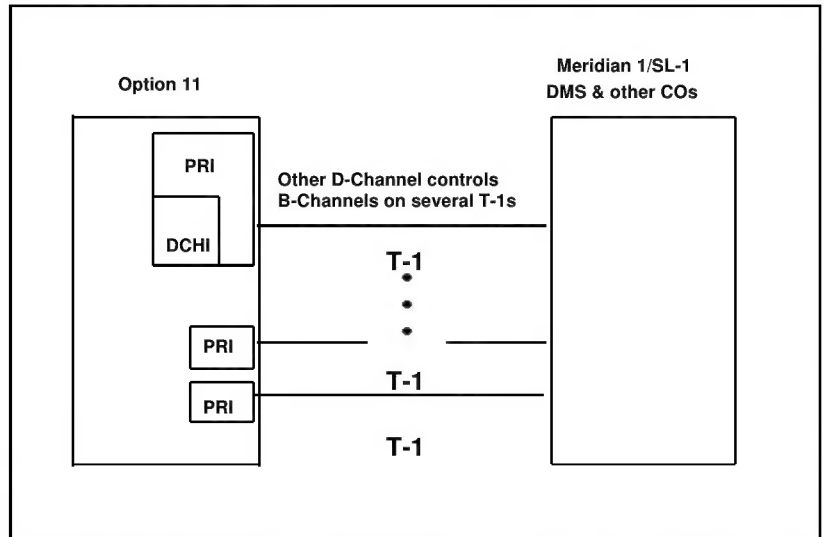
Figures 3 and 4 illustrate an nB+D PRI structure.

**Figure 3**  
**The nB+D Primary Rate Interface Structure**



**Note:** Option 11 supports the same range of Facility IDs (0 to 15) as other Meridian 1 and SL-1 systems. The Option 11, however, is physically limited to a maximum of 8 DS1 facilities and 190 B-channels. The primary D-Channel will always have a Facility ID of 0, and the backup D-Channel a Facility ID of 1.

**Figure 4**  
**nB+D PRI to the Network**



### **Possible PRI network configurations**

The Meridian 1 Option 11 DTI/PRI can interface with the following systems (see Figure 2):

- other Meridian 1 systems (including Meridian 1/SL-1 and SL-100)
- DMS-100 systems
- DMS-250 systems
- AT&T #4ESS and #5ESS systems
- other devices that support a standard Q.931 protocol.